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DEPARTMENT OF HEALTH

ESTATECODE

GUIDANCE
ON THE

STRATEGY FOR ESTATE INFORMATION AND COMPUTER TECHNOLOGY

DEPARTMENT OF HEALTH

ESTATECODE

STRATEGY FOR ESTATE INFORMATION AND COMPUTER TECHNOLOGY

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DEPARTMENT OF HEALTH

Advisory Group on Estate Management

Part of
ESTATECODE
Level 2

Guidance on the

STRATEGY FOR ESTATE INFORMATION AND COMPUTER TECHNOLOGY

Summary

1. Introduction
2. Estate Strategies
3. Estate Information and Computer Technology
4. Developing a Strategy
5. Staff and Training
6. Estate Medium Term Strategies

Appendix A Guidance for Information Strategies

Appendix B Glossary

Appendix C Systems Analysis

Appendix D Currently Available Software

Appendix E Strategy Summary Form

This Guidance is issued by the Advisory Group on Estate Management. Any enquiries on it should be made to the AGEM Secretariat, Estate and Property Management Directorate, Euston Tower, 286 Euston Road, London NW1 3DN

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Summary

Specialist Regional and District Computer/Information Departments are currently charged with developing a strategy for the development of information and computer technology for all Departments and disciplines in the NHS.

The importance of the estate to healthcare is now recognised and it is vital that the estate requirements are reflected in Authorities' IT strategies.

The IT and computer requirements of the estate are, generally, wider than other NHS areas covering not only information and office systems but also Computer-Aided-Design and on-line monitoring facilities.

It is in the interests of Estate Departments that at least an outline strategy is generated internally to provide the specialist staff with a basis upon which to work and to ensure that the IT strategy is integrated with the overall estate development strategy.

A strategy should include all requirements with priorities and cost/benefit analyses together with details of the relevance of the various requirements to healthcare and estate development. The implications of the strategy for estate staff and their training needs should also be assessed.

It is possible that the estate requirements may be seen as a relatively low priority within an Authority's overall strategy and in this case it may be necessary to implement an interim medium-term strategy. However, even such a medium-term strategy should be based, as far as possible, on an estate outline strategy and the broad Authority strategy.

1. *Introduction*

During 1987 advice was issued which attempted to set the scene for NHS information and Information Technology (IT) for the period up to 1999. In the past Estate Management Departments have, for a variety of reasons and apart from a few exceptions, been outside the mainstream of NHS IT and it is vital that, just as the importance of the NHS estate is now recognised, the estate receives its share of IT resource.

This document will summarise some of the recent advice and try to put it into an estate context and will suggest some general approaches to information and IT which Regional and District Estate Managers may wish to consider. For most disciplines the computer technology emphasis is almost entirely on information systems. However, estate requirements tend to cover a broader spectrum including Computer-Aided-Design and on-line monitoring systems. This document will also attempt to address these wider requirements.

Advice which has been considered in preparing this document includes:

NHS Information Management Group *(ie Health Services Information, Centre for Information Technology/Corporate Data Administration — CIT/CDA now NHS Information Management Centre — IMC)* publications —

"A National Strategic Framework"

"Information Management In The Hospital And Community Health Services — Guidance For Information Strategies"

"Structured Approaches To Investment Decisions For Information Technology"

The AGEM Estate "Körner equivalent" document detailing the Estate Minimum Data Set and Central Returns requirements —

"Estate Management Information In The NHS"

The DHSS Circular concerning NHS Estate Management —

HC(86)13

Some of the concepts and terminology used in this document may be unfamiliar to some estate staff, so an explanatory Glossary has been included at Appendix B. Asterisks mark items that are more fully explained in that Appendix.

2. *Estate Strategies*

The NHS Information Management Group publication "Information Management In The Hospital And Community Health Services — Guidance For Information Strategies" is summarised in Appendix A where various strategy requirements are outlined. These are aimed at those responsible for information and IT development at Regions and Districts. The headings and requirements are given below together with the implications arising for Estate Managers.

Information Requirements

1. Plans and schedules should be drawn up to identify the information requirements of the Authorities' basic services.

2. A specification for a methodology should be established for identifying the information and relating it to the aims, objectives and functions of Authorities. (Estate Managers must make themselves aware of, and make contact with, those within their Authorities who are responsible for information and IT. These will include Regional and District computer staff and Information Officers. In some cases estate staff already have an input into IT development.)

3. The flow of information and the aggregation required for senior management should be identified. (The information and computer technology requirements of the estate are outlined in Section 3. One approach to setting and checking an IT strategy for senior management that uses a "top-down" method is explained in Section 4.)

Definition of Roles

4. Tasks to be handled at Region or District should be defined together with general organisation, manpower and plans. (Estate Managers may find it useful to assign one or more of their staff part or full time to concern themselves specifically with estate IT. Further details are given in Section 5.)

Data Structure

5. Information requirements should be set in the context of Data Models*.

6. Regional strategies should establish how the Authorities' data will be managed and ensure that the NHS Data Model* is used where a significant database is created.

7. Regional strategies should ensure that the data collected is used consistently with the Authority's Data Model and that there is a policy to buy significant software only if it conforms to the NHS Data Model. (The function of Data Models is described in Appendix B. A feature of data models is that they are fairly easily understood by non-computer staff and it is usual for relevant users of an information system under development to be asked to verify the data models being used. Each Data Model usually covers a specific information area eg Estate Data Model*.)

IT System Specifications

8. IT specifications must emerge in a structured way from Data Models derived from the NHS Data Model and should minimise unnecessary local variations.

9. Specifications should be derived from the Common Basic Specification (CBS)* and should take advantage of automated facilities.

10. Plans should address how the CBS is to be utilised and ensure active participation in CBS formulation. (The function of a Common Basic Specification is described in Appendix B. Again, it is usual for those responsible for the development of an information system to verify the contents of the CBS with appropriate users.)

Communications between Computers

11. Procedures should be established for communication, networks, and voice/data transfer.

12. Procedures should be established for moving to Open Standard Interconnection (OSI)* and deciding the interim measures required.

13. The policy for OSI in the public service should be recognised with an indication of how this may be translated into local purchasing policies and implemented and maintained in HAs. (It may be that Estate Departments already have some experience in this area perhaps from the use of on-line monitoring systems or specification and installation of modern telephone exchanges. Communications considerations will vary in importance depending on the computer configuration chosen eg networked* or multi-user. If networks already exist in an Authority or are detailed as part of an existing strategy, then it is important that any additional networks are planned bearing in mind compatibility with these networks.)

Priorities and Investment Plans

14. An information inventory* should be produced with an appraised, costed and time-scaled investment plan.

15. A firm five year plan should be produced with reasonable cost estimates together with the desired strategic situation extended to 1998/99. (Although Regional and District computer and/or information staff will be responsible for overall strategy there is much that estate staff can and should do to prepare their specific requirements. This is covered in Section 4 and includes some information on investment appraisals.)

Managing Projects

16. Consideration should be given to IT system design and implementation and structured methods (SSADM/PROMPT).* There should be a uniform Regional approach for significant developments. (An important feature in current system developments (both in the analysis and project management phases) is that much greater emphasis is placed on involving the user in order to attempt to ensure that systems meet their needs.)

Accuracy, Audit and Confidentiality

17. Measures should be established to ensure data accuracy by validity and plausibility checking.

18. Decisions should be taken on the extent of information audits*.

19. Definitions of data protection* policies and procedures should be established. (Much estate information originates from operational systems and is thus, generally, reliable. Additionally, there are few estate systems which involve data protection aspects. However, some estate data (eg property appraisals) are susceptible to variations in meaning and accuracy and also have a strong influence on major decisions and in these cases an information audit may be relevant.)

Training

20. Training plans should be created showing numbers of staff, types of training, assessment of in-house capabilities and outside courses.

21. Consideration should be given to the manpower/financial implications of training. (This topic is discussed in Section 5.)

Information Use

22. Methods should be established to encourage the use of information and demonstrate its use in managerial (especially review) processes and clinical/nursing areas.

23. Strategies should be established to change cultural attitudes to information use in management including training and dissemination of examples of good practice. (Elements of these points are related to training while others relate to the usefulness of information to management. Part of Section 4 addresses this area.)

3. *Estate Information and Computer Technology*

The major areas of estate information and computer technology include the following:

1. Information Systems ie

   a. Registers of land, property, equipment etc with associated data

   b. Operational information on work done by in-house and contract staff, parts and materials and utility usage etc related to register items

   c. Planning information on register items eg remaining operational life, physical condition, usage etc

   d. Financial information on estate budgets, expenditure etc together with financial data drawn from the registers and operational and planning areas

   e. Graphical data as an extension of register and planning information (eg site plans) and operational systems (eg engineering drawings).

The minimum data set and central returns for the estate are now defined and form a basis for planning the content of information systems. Information systems support management activities and initiatives like asset accounting and departmental costing.

2. Computer-Aided-Design and Drawing Systems

Currently, CAD systems are usually implemented on dedicated hardware but advances in technology present the possibility of allowing CAD and other systems to be run on the same hardware simultaneously. There may be a requirement for CAD facilities at both Region and District level.

3. Modelling Systems for Planning

Modelling systems will have a place in many planning situations where there is a requirement to test "what if?" options.

4. Project Management

This is a specialist area and a number of packages are available for controlling the financial and manpower aspects of project management.

5. Expert Systems

Currently there are few expert system applications suitable for use in NHS Estate Departments, but such areas as fault-diagnosis and some design problems are likely to be addressed in the near future.

6. Office Systems

Including word processing, electronic mail and desk top publishing. These systems will support requirements like standard specifications and job descriptions.

7. Building/Energy Management Systems

These systems are probably more a part of the general estate development function but should be seen in the IT context as there is a known use of data from these systems in estate information systems.

8. Portable Data-Collection

Hand-held computers, bar-code readers and other portable devices have applications in areas where data is to be collected at sites remote from a main computer installation. Some Authorities have already used this technology for stock control systems, energy meter-reading collection and the collection of property appraisal data.

9. Communications

Potentially there is a requirement to communicate between all of the areas mentioned above. The communications link may be at one or more levels depending on the application. For example, to allow communication between an on-line computer running a building management system and a microcomputer running energy-data analysis programs, a physical link between the machines and a protocol for data transmission are both required.

In many Authorities networks to connect a range of computers and computer-controlled equipment already exist or are detailed as part of an existing strategy and in these cases it is important that any additional networks are planned bearing in mind compatibility with existing systems.

Another area to be considered is the communication interface with other NHS disciplines and with external bodies. One long-term aim is probably an Authority-wide integrated information system. Estate functions which may interact with other disciplines at an information or data transfer level include:

Users/Clinical — defect reporting
— input into the design process
— specification of new equipment

Planners — strategic planning of the estate

Supplies — parts, materials, ordering and costing

Finance — budgets, costings, determination of overheads

Contractors — project management

4. *Developing a Strategy*

Those responsible for planning and implementing an Authority's information and computer strategy are charged with creating priorities, costs and benefits for the required systems. However, rather than expecting central, specialist groups to be entirely responsible for planning the development of estate information and computer technology a more satisfactory approach is for estate staff to have available at least an outline of their requirements. Additionally, this should enable a plan to fully reflect estate needs and be integrated with general estate development strategy. It may also be that the availability of at least a draft plan will enable the estate to gain a higher priority in the overall Region or District plan.

The strategy must relate directly to the delivery of healthcare, possibly via the areas of estate management, development and rationalisation. Within this context the strategy will result largely from the analysis of current systems (manual or computer based), the analysis of "business needs" ("top-down" approach) and investment appraisal.

For planning purposes the cost, priority and time-scale for development and implementation of the required systems must be estimated. Financial and manpower resource availability will limit the size and number of information systems and other applications that may be implemented over any particular period. In the case of information systems, the resource requirement for implementation will generally exceed the hardware/software purchase costs; therefore a great deal of attention should be given to the implementation aspects.

Current Systems

An analysis of current systems is undertaken to find out their extent, current and future effectiveness, remaining life and development needs and potential. Some input to this process will be available from an Information Inventory*. The analysis will include the current information collected and applications and hardware used. Other aspects which should be investigated are those of the current Estate Department responsibilities in areas overlapping with other disciplines eg stores, purchase ordering, invoicing and the split of estate responsibilities within the Region/District/Unit hierarchy eg capital work, property registers and appraisals.

When considering a current manual or computer system for re-implementation, attention must be paid to whether it currently fulfils all relevant requirements and is generally satisfactory, ie care should be taken that an unsuitable application is not upgraded with new hardware or software when there may be a real problem with the whole current approach.

One output from the current-system analysis will be a list of current areas of difficulty and symptoms of difficulties.

A "Top-Down" Approach to IT Strategy

Introduction

Historically, IT has developed to cover a range of activities, firstly, to support routine operational systems (eg Northern RHA's EMIS — Estate Management Information System); secondly, to provide database and online facilities (eg WIMS1 and 2); and lastly, for management support systems.

More recently another approach has emerged from commercial interest in how to use IT to gain a competitive edge in a particular business field and this has led to the consideration of strategies that ensure the most effective achievement of policy objectives. This consideration applies equally to NHS systems.

Current Approaches

Currently, IT strategies tend to concentrate on the use of information as a resource, the care and maintenance of data and the creation of a well organised information pool. These are all acceptable but usually the emphasis is only on the computerisation of processes. It is also necessary that "business direction" drives the IT/Data Processing direction, and there is (in the commercial sphere) a recognition that information systems are a key weapon in the battle with competitors. It is just as important that NHS systems are guided by "business objectives".

Many strategic plans still concentrate on developing new versions of existing systems and do not aim to solve situations where eg:

i Operational systems provide so much information that it is very difficult to use it as a basis for planning

ii A corporate data model is produced but there are no plans on how to migrate existing applications without major disruption

iii IT is not being used to effectively achieve strategic objectives

iv The full potential of current information systems is not being realised

v Duplicate and incompatible systems are sometimes developed due to difficulties in accessing existing systems.

A "top-down" approach should include a short study to produce a phased strategic plan of real options which recognise that:

i It is unlikely that, in the short or medium term, an organisation can transform all existing systems to an integrated set of ideal systems

ii There will be a gradual transition with many existing systems being retained for a long time while others are being redeveloped around them

iii It may not be cost effective to replace some existing systems.

Business Approach

What is required is a plan based on strategic and business objectives translated into relevant projects and concentrating on the organisation's needs and not on technical innovations.

To produce such a strategy two things are required, information on organisational and management strategies and the current position concerning IT and these strategies. The procedure is then to decide areas of inconsistency and weakness and thus on areas for action.

By discussions with senior management it is established what they consider to be "Critical Success Factors" (CSF's) for the organisation. (They may be able to outline 5 or 6 of these). For example, a District Estate Manager may be interested in achieving low property overheads or he may be asked by his General Manager to be able to show that directly-employed-labour is cost effective. Also, stated current strategies should be checked with senior management for confirmation or modification. Further discussions with middle management (eg Unit Works Officers) should make it possible to define some "Enterprise goals" which might include targets like:

Being able to clear 90% of ward requisitions on the day they are reported

Being able to meet all Health and Safety requirements within 6 months.

Next it must be decided how these goals can be converted to measurable targets eg for the first target above:

> Provide telephone and/or direct terminal entry of requisition work from wards
>
> Implement better integration between planned work and requisition work to reduce travelling time.

Lastly, the IT actions associated with each goal must be defined, for example, to implement ward level data entry there must be identification of suitable software and hardware, training of ward staff, etc.

The results from these processes are compared with the current situation regarding working and planned systems (including the results of the information inventory exercise) and missing areas or areas of clash and mismatch are identified. Additionally, differences may be detected in the views of the various levels of management, for example, subordinates' goals being incompatible with their bosses' goals, peer group goals being incompatible or goals being compatible but achievement targets varying.

One final task is, wherever possible, to compare the NHS organisation with a comparable commercial organisation.

Conclusion

The object of these exercises is that the information and computer strategy should be reappraised to resolve any clashes and ensure that it meets the overall objectives of the organisation.

Investment Appraisal

Introduction

In the past computer related projects have often been treated as isolated tasks without a need to deal with IT in a strategic context underpinning service aims, objectives and business needs. Investment appraisal must take place at a strategic and project level. Additionally, IT investments will need to take into account special factors not considered in normal value for money controls (see HN (87) 18 Option Appraisals), eg risks, short discount timescales, technological developments, etc.

Scope of Investment Appraisals

Investment appraisal is relevant to any proposal to expend or save resources. One potential investment may need to be appraised at several levels ie strategic/policy, major investment decision, major component option and/or small equipment purchase. Each level has its own procedure with a scale of appraisal appropriate to the size of investment.

Preconditions for Success

To use investment appraisal effectively there must be a broad view of value for money which is linked with management activities and concentrates on business needs as well as "net present value". There must also be a commitment to project management and to post-implementation review and an effort to accurately value investments and benefits not easily costed.

It must be appreciated that an appraisal is not once and for all but should be periodic throughout a project and that for effective appraisal there must be a clear definition of responsibilities of Departments/Authorities and clear procedural/technical guidance. It is important that adequate documentation on the reasons why decisions have been made is kept in order to judge if these were sensible in the light of assumptions at the time and to provide a baseline for further changes.

Management should check that procedures are used effectively and that training and, where necessary, specialist advice are available. There must be incentives for good appraisals.

These conditions should enable Authorities to evaluate existing manual and computer systems, to identify new requirements, to determine development priorities, to identify system objectives and to be aware of cost and risk factors.

Structured Approaches at the Strategic Level

A "top-down" approach provides direction from top management and a consensus on how IT can support "business" needs. It should identify the major resource investment requirements, a framework for priorities and hence an environment in which decisions on individual projects can be made.

Investment appraisal should ensure that the strategy has explored all relevant options, has addressed the Authority's/Unit's "business" needs within policy and service developments and has taken account of commitments to existing systems. It should also consider whether the Authority will have the resource and quality of management required to implement the strategy.

At this level the following is considered:

> How is IT linked to business strategy and where will investment have the greatest strategic impact?
>
> Is enough being spent and what is enough? Is the general approach benefit maximisation or cost minimisation?
>
> How is management at the service delivery level ensuring that benefits are realised and how will they know when these are maximised?

How will higher management ensure that there is a good return on investment?

Are the right applications being considered ie what functions and processes are of strategic importance?

Are any new technologies of great strategic importance?

Is there a balance between centrally provided utilities and the requirements of users?

How can all staff levels be educated to appreciate information use?

Is there a program to manage existing IT assets?

In a strategic context it is not appropriate to consider IT projects in isolation. Expected benefits need to be clearly defined with real targets (especially where valued benefits are not possible) and monitoring of progress together with the management accountability for meeting targets.

A strategy must set the limits to delegated authority ie the Region might expect the District to:

- Analyse the relevance of a project to the Authority's aims, business needs and project strategy
- Contribute to strategic aims and meet strategic standards
- Demonstrate project feasibility
- Show that the Authority can carry a project through
- Show that a project has clear end-products and that senior management has the commitment to achieve them within time and resource limits
- Define as clearly as possible expected benefits with an agreed procedure for monitoring and evaluating them.

An attitude to net present value must be decided particularly if and when a negative net present value is acceptable. Guidance will be needed on methods of periodic review of lengthy projects and there must be a balance between establishing partial benefits at an individual installation and the global cost justification level (which may be less easy to quantify).

Developmental View of Investment Appraisal

This approach is to judge whether better information systems provide better management and services. It recognises that:

- There must be a link between spending and healthcare (ie appraisal is not just an implementation of cost effective technology)

Appraisal must be linked to a plan of resulting operational and management changes and these changes must be managed

The cost of achieving and maintaining end user productivity is often more important than hardware costs

There must be discrimination between technical and management design aspects (the major issues concern management practices and information)

Managers need to ensure that IT enhances their staff's roles

IT affects relationships in an organisation and this must be managed.

Management tasks include:

Deciding the aspects of the organisation to develop

Setting goals and targets

Assessing end-user behavioural assumptions

Deciding what will change

Checking that expected benefits are clearly stated

Planning delivery of benefits

Deciding current performance measures and how to monitor any changes.

Structured Approach — Steps of Appraisal

1. Define the Planning Context — to set the development within the overall strategic/planning priorities.

2. Analyse the Problem — to identify problems, deficiencies in services and symptoms of problems (especially in the view of those directly involved). Define project boundaries to help identification and comparison of the costs/benefits of all activities which have changed as a result of the various options. Different options may have different boundaries, system lives and possibly the need for contingency plans. Appreciate that the convergent technologies* of Computing/Telecommunications/Office technology widen possible solutions. Consider project life, normally application software and the hardware lives are unrelated but should be compared. Costings should be prepared for whichever is the shortest of the following three periods:

i the expected project duration

ii 5, 7 or 10 years — not exceeding 5 years for office machines, microcomputers and other small projects; 7 years for medium computer projects; and 10 years for large computer and telecommunications projects

iii the expected life of the equipment.

3. Judge the Level of the Appraisal — to estimate, from the objectives of the appraisal, the required resource, and to ensure that those involved will commit the appropriate time.

4. Define Objectives, Constraints and Performance Criteria — to specify requirements in terms of desired services and performance, constraints to be satisfied and desirable features (where possible objectives should be defined in patient service terms).

5. Develop Options — radical and do-nothing options should be included together with options favoured by influential groups (this may save time later).

6. Rank Options — from 4 define the minimum required standards and the constraints which may rule out some options. Initially, similar options may be considered as a single representative option. A coarse cost/benefit analysis may exclude some options as clearly inferior or no better than the current situation. However, it may be advantageous to retain options for which there are powerful lobbies.

7. Consultation — consult those affected by the possible outcome from options on the objectives and options selected for further detailed consideration.

8. Evaluation of Options — after ranking options in stage 6 the short-listed options are evaluated by preparation of:

A detailed description

An assessment of benefits, quantifying effectiveness in satisfying project objectives

An assessment of revenue costs (running costs frequently outweigh capital costs)

An assessment of capital costs

Discount capital/revenue costs for net present value at 5% test discount rate

Details and assessment of non-costed consequences.

Unquantifiable outcomes present difficulties, so descriptions of anticipated benefits should include measures to be used for monitoring achievements. A weighting and ranking process can be used to indicate relative worth of benefits and to expose assumptions and value judgements. These might include changes in work throughput and training requirements and alterations in the satisfaction level of patients and staff.

How well alternative options meet requirements will depend on the degree of uncertainty and risk of each option, the stability and duration of the user's requirement and the management action and organisational changes that are required to achieve the benefits.

Another important factor is possible expenditure on contingency arrangements. Computer systems are vulnerable to technical and other problems and it is necessary to consider the types of risks and associated probable losses, the cost of losses if no back-up is available and, in the event of failure, the minimum required computerised service and its cost.

Uncertainties will include factors such as lack of previous experience in the application or systems (eg unfamiliarity with hardware and operating systems and uncertain availability of experienced staff), accuracy of sizing estimates and the impact on work methods and interactions of a new system.

In identifying and evaluating costs and benefits there is sometimes a tendency that resource needs are under-estimated, difficulties minimised and over-optimistic timing and benefit predictions made.

9. Sensitivity Analysis — the most favourable options are tested for robustness by varying various (critical) assumptions. Options are subjected to the impact of variations in resource requirements, timescales and outcomes. Sensitive areas are identified and assumptions stated (areas for later monitoring may thus be identified)

10. Presentation of Results and Selection of Preferred Option — results may be ambiguous, so critical trade-offs need to be explicit and the presentation should highlight the nature of the judgements made. Results can be presented in table form with headings:

Problems, deficiencies and symptoms

Objectives and decision criteria

Ranking and any weighting

Costs, benefits and any discounting

Sensitivity

Highlighted choice(s)

11. Post Implementation Review — to measure the extent that a system has achieved its objectives and monitor possible changes of requirements or benefits realised

Generally, this procedure is an iterative one and should answer the questions — why do it, why now, why this way and, is the system worth it?

General Strategy Factors

When specific information systems and applications have been identified as being of interest, then their priority, implementation resource requirement, timescale and benefits must be estimated. When computer systems are simply being transferred onto new equipment or upgraded the resource requirements may not be great but during a new implementation, particularly of information system, there may be a need for additional staff. These staff may be consultant or temporary contract staff or temporarily seconded in-house staff. These considerations are detailed below.

Implementation

Factors to be considered when planning an implementation include:

Does the necessary base information required for the application already exist? If not, how is it to be collected and how long will it take? Have coding systems to be decided? If the base information required exists, what form is it in? How is the information to be transferred into a new application and how long will it take?

Are suitably trained staff available? Must in-house staff be trained or can contract staff be used? (There is usually a requirement for additional staff during the first data-gathering stage of an implementation. In the longer term it is useful if some in-house staff understand the application and have basic training on the hardware.)

Is any new documentation (eg data entry forms, computer stationery, etc) required. Must this documentation be designed, and what is the period before it can be obtained?

Are users trained and ready to bring into use a new application? Is there a change-over period and must old and new applications be run in parallel for that period? Can the available staff run parallel systems during such a period?

Hardware

Where estate IT and computer requirements are provided as a central computer service, the important factor in deciding hardware strategy will be consideration of any Regional or District hardware standards. Purchase and support of such standard systems are usually easier and cheaper than that for a system solely used by an Estate Department.

Hardware strategy will also be strongly influenced by management strategy. The most diverse management strategies are on one hand

the use of a large District or Regionally based machine supporting all Unit and District users and on the other the use of stand-alone or small multi-user machines at each individual site. Most Districts will probably have some combination of these approaches with a larger or smaller multi-user system together with some single-user machines for particular applications or sites. Controlling factors will include the geography and management style of the District.

Obviously the type of hardware selected must support the software requirements of a strategy and broadly this will be achieved by choosing packages compatible with the hardware , by modifying existing packages, by implementing existing specifications (including CBS) or developing entirely new applications from scratch.

Other factors relevant to hardware policy include:

Back-up machines — if a large machine is supporting many day-to-day applications what happens when the system crashes? Care should be taken that a service contract guarantees that the system will be back on-line in an acceptable time or that vital work can be transferred to another system.

Future capacity — together with the implementation strategy an estimate should be made of the requirements for future numbers of users and data storage. The hardware selected must be able to be expanded to meet these requirements.

Single-user machines — some WIMS1 modules, design programs and other packages may well need to be run (perhaps at remote sites or in specialist departments) or only be available on single-user machines. These machines may also be useful for local word-processing, spread-sheet and other packages.

Must new equipment be purchased? — in circumstances where hardware strategy is not yet finalised but current hardware is limited in capacity or performance, or is unreliable, or all the required applications are not available on newer hardware, it may be worthwhile leasing equipment in the interim. In the case of smaller systems it may also be worthwhile to see if equipment can be borrowed or transferred from another Department.

Presenting a Strategy

The output from the strategy development process will include documents detailing the investment appraisal and "business case" for each project. A summary of each potential project may also be prepared possibly as shown in Appendix E.

5. *Staff and Training*

In the ideal situation the majority of estate IT and computer requirements will be provided as a central computer service. The estate inputs required are a knowledge of the use of the applications provided, a role in defining and developing estate applications and the monitoring of the progress of estate application development. However, there will also always be a need for specialist technical knowledge in IT and computer areas which overlap with estate management responsibilities eg building/energy management systems.

The implications of this for estate staff and training are therefore:

That all estate staff should have a broad appreciation of the potential use of IT

That selected staff should have particular knowledge of certain applications although, in a few areas, some staff will need specialist technical knowledge.

In the medium term the ideal situation may not be attainable and it may be necessary to provide wider expertise from estate staff. Historically, it has been unusual for estate staff to be assigned specifically to concentrate on IT particularly at District level. A frequently used approach has been to allow estate staff with a personal interest in the topic to involve themselves with IT on an ad-hoc basis. This procedure has been successful in some instances but is very vulnerable to failure if the enthusiast leaves or is promoted. The aim must be to ensure that all estate staff have a broad appreciation of the use of IT and that if specialist knowledge is required then it is spread among a number of staff.

It may be that some expertise (for example, with communications, computerised control or information systems) may already exist within an Estate Department and in these cases efforts to spread the knowledge by means of internal training are usually worthwhile, particularly where the expertise is confined to individuals.

The broad and specialist knowledge categories may be divided into different requirements for the various levels of staff:

Senior Management
- The importance of information in the management process
- The broad District/Region IT and computer strategy
- The broad requirements of the Data Protection Act

Middle Management/Foremen
- The broad District/Region IT and computer strategy
- The source, accuracy and reliability of the information used within the Estate Department

How to use any ad hoc query facilities available on the estate information system
The requirements of the Data Protection Act in relation to the estate applications in use
Building/energy management and other specialist systems

Tradesmen/Clerical Staff
Function of the estate applications in use
Keyboard skills

A possible method of assigning specialist areas is to associate them with the relevant estate staff, eg:

Computer Aided Design and project management may be of special interest to Building Officers, Architects, Quantity Surveyors and other staff associated with capital schemes.

Building/energy management systems may involve engineering, operational and energy conservation staff.

Operational information systems will tend to interest Unit based staff while strategic systems will be more applicable to Regional or District staff.

To a large extent staffing levels at District are controlled by the size of the District, although it may be possible for staff from large Units to take responsibility for operational information systems, building/energy management systems etc. However, in small Districts insufficient estate staff will be available to maintain an adequate level of IT and computer technology expertise and in these cases the responsibilities must fall more strongly on Regional/District computer/information Departments.

Once an estate information and computer strategy is in existence as part of an overall Authority strategy, at least one member of the estate staff should have a firm commitment to liaise directly with Regional or District computer or information staff. This individual should be of sufficient grade to be able to input details of progress with the IT strategy to the general estate planning process. It should be a mandatory management procedure for an estate officer to be charged with liaison and monitoring of estate related projects.

6. *Estate Medium Term Strategies*

This document is intended to give guidance to enable estate management to move more into the mainstream of NHS computing by ensuring that estate requirements are considered and planned for in an Authority's IT strategy. However, in the past the provision of estate requirements has often not been seen as a high priority and there will doubtless be occasions in the future when a medium-term strategy must be implemented as an interim measure before the overall Authority IT strategy for a fully integrated system comes to fruition.

Estate Department computer installations have tended to grow in a piecemeal way as new software has arrived and as knowledge on what is wanted has increased. Current situations include Estate Departments where:

Obsolescent hardware is being used to run an increasing range of software but the performance, capacity and reliability of that hardware are now becoming unacceptable

Some potential computer users are looking for a "start-up" computer installation

Some have a reasonably satisfactory current situation but are seeking to plan further implementations within a wider context.

In all these situations the outline estate strategy (which will be the output from the considerations in Section 4) still has a very useful role in guiding decisions, as it will contain information on the information or application areas of interest and their priorities, the methods and schedules for implementation, costs and predicted benefits (cash and non-cash) and hardware policy.

These factors are obviously not independent, for example, the choice of software will be limited by the type of hardware it is to serve and whether that hardware is available. Also, all of these factors must match available financial and manpower resource. However, even in the situation where estate IT development is being undertaken as an interim measure before implementation of an Authority's overall strategy, some resources may be available from the Authority's sources on the grounds that the estate development is being undertaken within a planned framework which, eventually, will merge with the overall strategy.

One outcome of implementing a medium-term strategy may be that the solutions are based more on software "packages" than considered ideal for a longer term solution and may contain areas of overlap with other systems. Appendix D provides a list of currently available software packages relevant to estate applications. Additionally, "electronic office" facilities (ie word processing, spread sheet, general purpose database management system and electronic mail) may be required together with locally developed packages which may have a continuing role in an estate strategy.

It should be noted that if a wide range of software is required it is unlikely that, in the foreseeable future, it will all be available to run on the same type of hardware, and this must obviously be taken into account when considering hardware policy and the methods and schedules for implementation.

There are many possible types and combinations of IT and computer facilities and a decision on which of these may be relevant to a particular Authority will be affected by various

factors including the output from the estate strategy exercise, the local management style and the geographical layout of the District/Region.

A very important aspect of any strategy is to avoid duplication of systems by different disciplines or departments. The most effective policy is usually to allow data collected as a by-product of operational systems to be used as base data for other systems.

Even if a medium term strategy is being implemented, it still may be possible to use the District or Regional "standard" hardware. In most situations there is a range of possible computer configurations with the following main characteristics (see table on next page):

Installation Type	Software	Advantages	Disadvantages
Individual Small Computers	Very wide range of packages available	Cheap! Flexible. Implementation and support is easy. If a "standard" operating system and disk format are used then data/program exchange is straightforward.	Package capabilities may be limited. Little possibility of expansion. Package software will not be integrated.
Networked Small Computers	Very wide range of packages available	Cheap. Fairly flexible. Implementation and support is fairly easy. Data/program exchange is straightforward.	Package capabilities may be limited. Little possibility of expansion. Package software will not be integrated. Network Supervisor required.
Multi-user small computer (2–6 terminals)	If with single-user operating system partition then many packages available. Depending on the operating system a range of packages will be available.	Larger applications will be powerful and multi-user. Clusters of small multi-user machines can be networked.	Expensive. No expansion to larger multi-user system. Systems Administrator required.
Multi-user super-micro or mini (4–20+ terminals)	If with single-user operating system partition then many packages available. Depending on the operating system a range of packages will be available.	Larger applications will be powerful and multi-user. Clusters of multi-user machines can be networked.	Expensive! Systems Administrator required. Small "local" users can feel isolated.

Guidance for Information Strategies

Introduction

The Health Services Information, CDA/CIT (IMC) document "Guidance For Information Strategies" (published in July 1987) gives an introduction and guidelines to the contents of an NHS IT strategy. This guidance is aimed at those responsible for information and IT development at Regions and Districts and sets out an eighteen-month task to prepare a strategy for the next ten years. This Appendix summarises the document. Although the guidelines are for an information strategy, the requirements apply equally well to other computer technology areas and this extra dimension is considered in Section 2.

The information strategy is considered in two areas:

information* requirements

installation and use of Information Technology*

The use of IT has potential for increasing productivity and creating an exciting and highly motivating environment; however there is also the possibility of waste and frustration.

Areas for possible major development concern communications, including the extensive use of telephone and computer branch-exchanges (PBX/CBX),* electronic messaging within Departments and inter-Department, the use of hand-held data capture devices and word processing. Within 10 years almost every hospital department might well be using IT to run its administrative and professional affairs. This will need computer networks in some cases, personal computers in others. With a network of compatible computers it becomes possible to foresee such applications as:

electronic remote ordering — of, say, maintenance jobs from wards

bar coding — of parts and materials

data for expert systems — for fault analysis and condition-based-maintenance

data exchange—eg between Estate Management Departments, Finance and Supplies

English language type query and graphical display facilities for managers*

The above is not intended as an exhaustive list but it gives a glimpse of the complexity and scope of Information Technology and illustrates the need for a strategy to capture information and use IT opportunities in a structured and controlled manner. Specifically, a strategy is needed because:

IT is a complex technical area

IT development is rapid with short equipment life cycles

Unless co-ordinated there is a danger of waste of resources

IT affects the whole organisation (development at the Department level is relatively straightforward) and needs co-ordinating for maximum return on investment.

A strategy for step by step progress may be outlined under the following headings:

Information Requirements
Definition of Roles
Data Structure
IT Systems Specifications
Communications between Computers
Priorities and Investment Plans
Managing Projects
Accuracy, Audit and Confidentiality
Training
Information Use

These steps cannot be undertaken throughout a District simultaneously but, in a structured way, Unit by Unit or Department by Department. The overall strategy defines the means employed to bring information requirements together, and the order in which all parts of the Authority are to be tackled with a timetable of Priority/Ranking/Scheduling which may be related to healthcare priorities. District approaches will vary as their current IT and information situations and strategies vary.

Information Requirements

The data needed to provide information for running, planning, reviewing and monitoring an organisation and its objectives must be defined. This requires that the functions and objectives of the organisation are clearly understood although this is particularly difficult in areas of overlap between different parts of the organisation. It is important not to concentrate just on administrative matters but also on operational systems. Thus:

1. Plans and schedules are needed to identify the information requirements of the Authorities' basic services eg wards, outpatients, theatres, laundry etc.

2. A specification is required for a methodology for identifying the information and relating it to the aims, objectives and functions of Authorities.

3. It is necessary to identify the flow of information and the aggregation required for senior management. (Regions and Districts generally need information aggregated from district level and from department level respectively. This information should also take into account central (ie Department of Health) requirements.

Definition of Roles

Information and IT strategies can only succeed with a sound organisational structure and with tasks clearly assigned. Authorities may decide that efficiency indicates that substantial systems be developed centrally and implementation supported centrally, but local needs must also be met to maintain an atmosphere of partnership. Thus:

4. Tasks to be handled at Region or District should be defined together with general organisation, manpower and plans. Where there is divided responsibility for information and IT, lines of responsibility should be made clear.

Data Structure

Defining information requirements allows the data needs to emerge. A definition of the relationships and meaning of data (a Data Model*) is needed because:

Data must be consistent

Data will be aggregated and manipulated, exchanged and shared

Processing and storage may be on a range of computers

Different disciplines need a common data-view.

An Authority needs a Data Administration function so as to let information users know what data an Authority has, what it means and where it is; and to prevent duplication and inconsistency. There will be an extensive common core of data for Departments in different HAs and an NHS Data Model* is being created (by CDA — IMC) to describe this. Thus:

5. Information requirements should be set in the context of Data Models*.

6. Regional strategies need to establish how the Authorities' data will be managed and ensure that the NHS Data Model* is used where a significant database is created.

7. Regional strategies also need to ensure that the data collected is used consistently with the Authority's Data Model and that there is a firm policy to buy significant software only if it conforms to the NHS Data Model.

IT System Specifications

Data Models* from information requirements and based on the NHS Data Model* should form the basis for IT system specifications. User requirements are needed before IT suppliers are approached and user specifications from different Districts and Regions will have much in common; hence a Common Basic Specification (CBS)* is being prepared by CDA. Thus:

8. IT specifications must emerge in a structured way from Data Models derived from the NHS Data Model and should minimise unnecessary local variations.

9. Specifications should be derived from the CBS and should take advantage of automated facilities.

10. Plans should address how the CBS is to be utilised and ensure active participation in CBS formulation.

Communications between Computers

Integrated IT solutions require that a range of computers can communicate. This involves many technical matters but the International Standards Organisation (ISO) has outlined an approach to Open Standards Interconnection (OSI).* The OSI framework groups standards into levels of a seven layer model, the lowest level concerns physical wiring while the highest level deals with applications. The NHS must define a set of standards from the OSI model which best suit its needs. Thus:

11. Procedures should be established for communication, networks, and voice/data transfer.

12. Procedures should be established for moving to OSI* and deciding on any interim measures required.

13. The policy for OSI* in the public service should be recognised with an indication of how this may be translated into local purchasing policies and implemented and maintained in HAs.

Priorities and Investment Plans

The identification of information requirements, creation of Data Models and the production of user specifications must culminate in an information investment plan, part of which will cover IT systems and hardware investment. The plan will be long-term and will have priorities associated with healthcare objectives and based on sound cost/benefit analyses. Before a plan is produced an inventory of existing information (data sources and system hardware) should be taken. The plan should include the translation of unsuitable current hardware and data structures to the desired standards and must ensure satisfactory interim facilities. The plan should also cover staff requirements and training. Thus:

14. An information inventory* should be produced with a subsequent appraised, costed and time-scaled investment plan.

15. A firm five year plan should be produced with reasonable cost estimates. (This should be possible but the nature of IT solutions over greater periods are difficult to predict although the desired strategic situation can be extended to 1998/99).

Managing Projects

IT system design, specification and implementation are complex, expensive and difficult to control due to interlocking timetables and varying responsibilities and tasks. There are a range of structured methods to assist in this area and these should relate to each other, eg Structured System Analysis and Design Methodology (SSADM)* for system analysis and Project Resource Organisation Management and Planning Techniques (PROMPT)* for project management. Thus:

16. Consideration should be given to IT system design and implementation and structured methods (SSADM/PROMPT). There should be a uniform Regional approach for significant developments.

Accuracy, Audit and Confidentiality

If data is to be used extensively the data capture stage must be accurate and this is more likely when data is gathered as part of an operational system (ie bottom-up). IT systems need built-in validation and consistency checks. Information audit* may be used to ensure that data collection procedures are appropriate to the users of the information. Full information audit is expensive, so it is usually best to focus on data captured independently of operational systems and information guiding the expenditure of significant resources. Data integration increases the problems of data protection which requires careful planning. Thus:

17. Measures should be established to ensure data accuracy by validity and plausibility checking.

18. Decisions should be taken on the extent of information audits*.

19. Definitions of data protection* policies and procedures should be established.

Training

In the near future the majority of NHS staff must use or interact with IT systems. This will vary from simple data input tasks to complex information extraction procedures. Training will therefore need to be well planned, varied and on a large scale if system implementation delays and ineffective use of new systems are not to occur. Some training will be in-house (Regional and District training centres); some, probably specialist, external with elements of "training the trainers". The training of managers to use IT systems effectively is an important area. Thus:

20. Training plans should be created showing numbers of staff, types of training, assessment of in-house capabilities and outside courses.

21. Consideration should be given to the manpower/financial implications of training.

Information Use

The implementation of a successful IT system is wasted if the information thus made available is not used by management to maximum effect. Professionals and managers at all levels in the NHS need to use information to understand the current situation, to plan and to monitor progress. Thus:

22. Methods should be established to encourage the use of information and demonstrate its use in managerial (especially review) processes and clinical/nursing areas.

23. Strategies should be established to change cultural attitudes to information use in management including training and dissemination of examples of good practice.

Glossary

Common Basic Specification (CBS)
The CDA–IMC is overseeing the evolution of the CBS in order to assist the development of NHS information systems. The CBS comprises the output from the SSADM* approach plus a functional hierarchy to which the SSADM outputs (data models, entity life histories and process descriptions) are linked. The functional hierarchy may be examined at the first stage of an information system project in order to define the borders of the system.

Convergent Technologies
In the past the technologies associated with computers, office systems, telecommunications, graphics etc were generally viewed separately and, technically, were separate. With the introduction of digital techniques and microprocessors the bases of the separate technologies began to converge and the process has continued up to the current situation where the boundaries, for example, between telecommunication and computer systems, are difficult to define.

Data Model
A mainly diagrammatic representation of the entities existing in an information system and the relationships between the entities. Part of the process of producing the data model is to ensure that it reflects the requirements of those who will be using applications developed from it and this is frequently done by holding a number of "workshops" where the model is shown and discussed. It has been found that the diagrammatic basis of the data model is usually well understood even by those with no direct experience of the techniques. Data Models are part of the output of Systems Analysis procedures (See Appendix C).

Data Protection Act
Passed in 1984 this Act covers all personal information kept on a computer by companies, public bodies and other organisations. Those holding the information must register details of what is held. There are requirements that personal details are accurate, current, secure and only used for the purposes for which they were registered. Subjects of the information have the right to check it and insist that inaccuracies are corrected and may seek compensation for difficulties caused by inaccurate information.

English language type query and graphical display facilities for managers
A problem with traditional computerised information systems was that the only way a new user-query about the system contents could be answered was by the production of a specification for the

required report which was passed to programmers for implementation leading eventually to the resultant program being run and the user query satisfied. This process was ineffective in answering ad hoc queries (specifically those from senior managers) and the current trend is to attempt to allow users to be able to frame queries using an English language like syntax and to receive immediate replies.

Estate Data Model
The first draft of the estate model has been produced by the CDA (now NHS IMC) who have the responsibility for ensuring that any future estate data model (which will form part of the Estate Common Basic Specification) is integrated with the data models of other disiplines.

Information
Data in the form of text, graphics etc. Information is unrelated to medium ie it may be transmitted by paper, speech or by a machine.

Information Audit
This procedure is intended to ensure that methods of data collection and handling are appropriate to the use of the data, eg so that users understand the accuracy and limitations of their data.

Information Inventory
A process of surveying and listing the range of information currently being collected by an Authority or department.

Information Technology (IT)
Systems, usually based on electronic devices, which transmit, receive or process information.

Networks
A number of computers or other digital devices connected together via a communication channel providing access for a number of users.

NHS Data Model
It has been recognised that there are problems of incompatibility between systems developed for different NHS disciplines eg supplies, treasurers etc. This led to a call for a corporate data model encompassing all NHS data. The CDA (now INC) is responsible for this work.

Open Standards Interconnection (OSI)
OSI is a computer system interconnection model supported by the International Standards Organisation. It defines seven possible layers of interconnection from physical connections to application standards.

PBX/CBX
Private Branch Exchanges/Computer Branch Exchanges are an example of convergent technologies* in that fully digital telephone exchanges are computer controlled and capable of handling communications between external computers as easily as, and simultaneously with, digitised voice transmissions.

Project Resource Organisation Management and Planning Techniques (PROMPT)
PROMPT is a methodology for managing projects. It separates the management components of running the project (ie organisation, plans and controls) from the technical components of building the system (ie activities and end-products).

Structured System Analysis and Design Methodology (SSADM)
SSADM is a formal structured method of analysing and designing information systems. Further details on Systems Analysis are given in Appendix C.

Systems Analysis

In order to produce an information system (whether to be implemented for manual or computer use) it is necessary to consider two main questions:

What tasks are required to be done?

What "things" must be considered in carrying out these tasks?

For example, an NHS Works Officer may define one task as "ensuring the availability of necessary plant, equipment and services". This general requirement may be split into two further definitions eg

Ensuring that failures of plant, equipment and services are minimised

Ensuring that when failures occur they are rectified within a reasonable period.

One part of ensuring that failures are minimised may include the task, "carry out planned preventive maintenance routine" At about this level of analysis it becomes necessary to define the things which are involved in this task, some of these will be physical objects; others will be concepts; others, possibly, a combination of the two. For example, to carry out a ppm routine it may be necessary to know about:

The particular piece of plant, equipment or service
The tradesmen who may be required to carry out the task
Any tools that are required
Any spares that are required
The planned maintenance schedule
The user department
etc

This is part of system analysis and is always a necessary part of producing an information system regardless of the intended method of implementing the system ie as a manual or computer system. The analysis may also be carried out with varying degrees of formality. For a very simple system the analysis process is probably carried out almost unconsciously but, where more complicated systems are considered, the analysis method usually needs to become more formal as it is more difficult to keep track of what is happening and whether the whole system has been considered.

Solutions to the "what tasks" and "what things" questions may be expressed as models of the system under investigation and are

sometimes called the PROCESS MODEL and the DATA MODEL. Another part of the analysis is to track the history of the "things" ie how they are created, what processes they are involved in and how they are deleted. This results in an ENTITY LIFE HISTORY.

NHS policy is that a formal method of systems analysis should be used in order that:

Any analysis is carried out rigorously

It is more more likely that data and process models resulting from analyses of different parts of the NHS will be compatible.

The recommended system is SSADM*

Currently Available Software

The range of available packages that may be considered when reviewing software strategy includes:

WIMS1 Modules
- Asset Management
- Stores
- Energy Monitoring
- Redecoration
- Budget Monitoring
- Maintenance Contracts
- Property Appraisal
- Property Management
- Annual Maintenance Plan
- Residential Property
- Contract Management
- EME Management
- Vehicle Management
- Labour Management

WIMS2 Applications
- Asset Operational/Labour Management
- Property and Land
- Strategic Planning
- Financial Control

Capital Works
- CONCISE
- CASHFLOW

Design
- SECAD
- HEVACOMP
- SCHEME MANAGER
- DESCEP
- AUTOSPEC
- OFFICE COSTING
- AMAZON (Cable Sizing)
- ELEC ,,
- ENBUILD
- ENCOMP
- ENMATS

This list is not exhaustive and specifically omits any requirements for large scale CAD systems (eg Acropolis, GDS etc) which will probably require dedicated hardware.

Appendix E *Strategy Form*

PROJECT:

AREAS INVOLVED/PROBLEMS/SYMPTOMS

RELATION TO AUTHORITY STRATEGY/HEALTH CARE/ESTATE DEVELOPMENT

PROJECT BRIEF DESCRIPTION

SENSITIVITY FACTORS

PRIORITY - HIGH/MED/LOW	SENSITIVITY STATUS – STABLE/ACCEPTABLE/POOR

COSTS - IMPLEMENTATION (INC HARDWARE)

ON-GOING

DISCOUNTED COSTS

BENEFITS - SAVINGS

BENEFITS - NON-CASH

WEIGHTING/DECISION FACTORS

FUTURE EXPANSION REQUIREMENTS (HARDWARE AND STAGED IMPLEMENTATIONS)

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